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WINTERING BEEF CATTLE IN THE APPALACHIAN REGION

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THE APPALACHIAN REGION

The area known as the Appalachian Mountain region extends from northern Alabama and Georgia to western Maine, involving the territory covered by the Smoky, Cumberland, Blue Ridge, Allegheny, Catskill, Adirondack, Green, and White Mountains (fig. 1).

The region is mainly a grazing ground, covered almost entirely with blue grass. Limestone is found throughout the area, which accounts somewhat for the excellent grazing characteristic of the region. Owing to the prevalence of desirable grass and much land that is too rough for tillage purposes, the area may be considered one of the most important beef-producing sections of the United States (fig. 2).

Most of the cattle handled in the Appalachian region are produced there and carried until 2 to 3 years of age, and marketed in the fall off grass. The main problem is that of winter feeding, so as to get the maximum use of grass during the summer grazing season.

There are two classes of cattlemen in this region—those producing feeder cattle and those who do not raise cattle, but buy feeders and fatten them on grass.

Until quite recent years it has been a common practice to keep steers until they are 3 or 4 years of age. Aged steers are still found in some sections of the region. Corn fodder and hay have been used extensively for winter feeding and silage comparatively little

(fig. 3). The native cattle in the region show a predominance of Shorthorn blood and have considerable "scale," being growthy and rather slow maturing. Aged steers are usually somewhat coarse, being heavy boned.

Better feeding practices and the use of early maturing bulls have made it possible to produce steers of increased weight at a younger age, and are gradually causing the 3 or 4 year old steer to become scarce. In order to determine the relative values of various methods of wintering cattle in the Appalachian region, the United States Department of Agriculture, in cooperation with the West Virginia Agricultural Experiment Station, carried on a series of experiments in Greenbrier County, W. Va. The effect of winter rations on subsequent gains made the following summer has been determined for: Cows raising calves, calves, yearlings, and 2-year-old steers. The experiments began with yearling steers in the winter of 1914–15 and continued through to 1918, followed by experiments with cows, 1915 to 1919; with calves, 1916 to 1919; and with 2-year-old steers, 1919 to 1922.

FIG. 1.—Appalachian Mountain ranges and region to which the discussion in this publication is applicable. The black dot shows approximate location where experiments were conducted

WINTERING BEEF COWS

The production of calves of the desirable beef type is essential in the profitable raising of beef cattle. To produce such calves requires good beef foundation stock, careful feeding and management of the herd, and liberal feeding of the calves.

Table 1 shows a comparison of various winter rations for breeding cows and their effect on the gains made by the cattle the following summer. Grade Shorthorn, Hereford, and Aberdeen-Angus cows were used. Their initial weights ranged from 740 to 870 pounds. Ten cows were used in each lot, and during the winter they had feed that would maintain them in good, thrifty condition. An exception occurred, however, during the first year; the loss in that year is attributed to the extremely low quality of the silage fed. With that exception the cows gained in weight on the winter rations until calves were dropped. After being turned on to grass the cows had no feed except pasture. As the rations fed the first winter were below the standard in quality, it is best not to make comparisons between that year and the three years following. It may be said, however, for that particular year, that cottonseed meal showed an advantage over mixed hay when fed in conjunction with corn silage and wheat straw. The cottonseed-meal ration was the cheapest ration fed the first winter, and the shock-corn ration fed to lot 4 the

most expensive. The latter was lacking in succulence and was not continued after the first year.

FIG. 2.—Typical valley scene in Appalachian region. The valleys are very fertile and produce the winter feed supply

TABLE 1.—*Summary of four years' experiments with cows raising calves*

Lot and winter ration [1]	Year	Winter feeding			Summer pasture		Winter and summer	
		Days fed	Gain (+) or loss (−) per head	Feed cost per head [2]	Days [3]	Gain (+) or loss (−) per head	Total gain (+) or loss (−) per head	Total feed cost per head [4]
LOT 1			*Pounds*			*Pounds*	*Pounds*	
Corn silage, mixed hay, and wheat straw.	First	122	[5] −87	$17.27	140	+137	+50	$31.91
					196	+107	+23	
	Second	137	+24	21.33				(7)
	Third	134	+26	18.64	140	−5	+21	32.44
	Fourth	134	+21	21.53				(7)
LOT 2								
Corn silage, soy-bean hay, and wheat straw.	Second	137	+41	20.30				(7)
	Third	134	+49	17.83	140		49	31.63
	Fourth	134	+52	19.84				(7)
LOT 3								
Corn silage, cottonseed meal, and wheat straw.	First	122	[5] −35	17.13	140	+81	46	31.77
					196	+50	15	
	Second	137	+24	18.81				(7)
	Third	134	+75	16.75	140	−5	70	30.55
	Fourth	134	+16	18.83				(7)
LOT 4								
Shock corn, mixed hay, and wheat straw.	First	122	[6] −49	27.50	140	+59	10	42.14
					196	+45	−4	

[1] For quantities of each feed recommended for use see page 10.
[2] Average feed prices used—corn silage $6; mixed hay $18; soy-bean hay $17; cottonseed meal $50; wheat straw $7; shock corn $17 per ton; ear corn $0.96 per bushel; and pasture $0.06 per head per day.
[3] Pasture days are shown as 140 and 196 days for the first summer so that comparisons can be made with the third summer when the cows were allowed only 140 days' pasture.
[4] Total cost of feeds is the feed costs for the days on winter feed plus the remainder of the year figured at the rate of $0.06 per head per day.
[5] The silage fed the first year was of poor quality and the cows lost weight in consequence.
[6] This ration lacks succulence, and was not used after the first year.
[7] Cows disposed of at end of winter period.

The last three years' winter feeding with three lots of cows gave more significant results. The cows in lot 1—fed corn silage, mixed hay, and wheat straw—made an average winter gain of 23.66 pounds for the three years; those in lot 2—fed corn silage, soy-bean hay, and wheat straw—gained 47.33 pounds; and those in lot 3—fed corn silage, cottonseed meal, and wheat straw—gained 38.3 pounds. The winter-feed bill per cow averaged $20.47 for lot 1, $19.32 for lot 2, and $18.13 for lot 3. The cottonseed-meal ration was the most economical winter ration each year, and was followed by the soy-bean-hay ration. The mixed-hay ration was the most expensive for the three-year period.

The cows fed during the second and fourth winters were sold at the end of the winter feeding period, leaving summer pasture experiments for only the first and third winters. During the first summer

FIG. 3.—Steers being roughed through winter on corn fodder

grazing period the cows in lot 1 made a gain of 137 pounds in 140 days and 107 in 196 days. This same lot lost 87 pounds during the preceding winter, which was considerably more than any of the other lots, yet the net gain for the year was the greatest.

During the third year the cows lost weight for the first 28 days on pasture, but gained considerably the next two months. From July until the end of the first week in September, when sold, they lost weight and were practically the same weight as when turned on grass the preceding April.

The two years' summer grazing showed that cows maintaining their weight or even losing weight during the winter made the largest summer gains on pasture. These tests have shown further that one of the most essential factors to consider in the winter feeding of cows is the use of the most economical ration that will practically maintain their weight. The value of the pasture deteriorated

rapidly after October 1 the first year. The fact that it was a normal year indicates that the cattle were kept on pastures too long in the fall. It seems to be a common practice in the Appalachian region, as well as in most other grazing areas, to start cattle on grass before it has a sufficient growth and to keep them on it much longer than is desirable. The practice is beneficial to neither pasture nor cattle. During the first summer all the cows were heavier at the end of 140 days' grazing than they were at 196 days.

WINTERING BEEF CALVES

To winter calves so that they will make the greatest gain from grass in the summer is one of the most important problems of the beef-cattle raiser. Calves should never be allowed to lose weight. Their wintering rations should contain considerable protein in the form of cottonseed meal, linseed meal, or a legume hay, such as clover, alfalfa, soy bean, or cowpea.

TABLE 2.—*Summary of three years' experiments with calves*

Lot and winter ration [1]	Year	Winter feeding			Summer pasture		Winter and summer	
		Days fed	Gain (+) or loss (−) per head	Feed cost per head	Days	Gain (+) or loss (−) per head	Total gain (+) or loss (−) per head	Total feed cost per head [2]
LOT 1			*Pounds*			*Pounds*	*Pounds*	
Corn silage, rye hay, and cottonseed meal.	First	133	+56	$11.49	168	+185	+241	$18.45
	Second	134	+42	11.32	168	+204	+246	18.25
	Third	135	+66	12.02	168	+191	+257	18.92
Average		134	+55	11.61		+193	+248	18.54
LOT 2								
Corn silage and clover hay.	First	133	+41	10.41	168	+217	+258	17.37
	Second	134	+44	10.08	168	+194	+238	17.01
	Third	135	+55	9.96	168	+164	+219	16.86
Average		134	+46	10.15		+192	+238	17.08
LOT 3								
Mixed hay and grain mixture.[3]	First	133	+73	17.19	168	+193	+266	24.15
	Second	134	+102	19.55	168	+181	+283	26.48
	Third	135	+118	17.48	168	+172	+290	24.38
Average		134	+98	18.07		+182	+280	25.00

[1] Quantities recommended for each feed are given on page 10.
[2] The total feed cost is the cost of the feed for the winter period plus 3 cents per head per day for the remainder of the year.
[3] Grain mixture $39.76 a ton; rye hay $18 a ton; pasture 3 cents per head per day; other feed prices same as in Table 1. This grain mixture consisted of 3 parts, by weight, of corn, 1 of bran, and 1 of linseed meal.

Table 2 shows a summary of experimental work with calves in West Virginia. Silage rations were compared with a mixed hay and grain ration. A study of the table shows that all lots of calves made considerable gain during the winter feeding period. The calves making the lowest winter gains made the highest summer gains, but only in one instance were the summer gains sufficient to

bring the yearly gains above those for the calves making the highest winter gains. This particular instance was with lot 2 in the first year's work.

For an average of the three years the calves in lot 1, fed corn silage, rye hay, and cottonseed meal, made a winter gain of 55 pounds and combined winter and summer gain of 248 pounds; those in lot 2, fed corn silage and clover hay, 46 pounds of winter gain and 238 combined winter and summer; and those in lot 3, fed mixed hay and grain mixture, 98 pounds of winter gain and 280 pounds of combined winter and summer gains. Thus lot 3 made practically twice as much winter gain as the lots fed the silage rations, but gained 10 pounds less during the summer grazing period, and weighed only 32 pounds more than the calves in lot 1, and 42 more than those in lot 2. The additional cost of the grain mixture was

FIG. 4.—Steers on grass in April after being wintered on corn silage, cottonseed meal, and wheat straw

largely offset by a higher market value of the calves, owing to increased weight and higher finish.

WINTERING YEARLING STEERS

The rate of feeding of yearling steers during the winter should be governed somewhat by the manner in which they are to be handled the following summer (figs. 4, 5, 6). If they are to be developed into feeders to be finished on grain the following winter as 2-year-olds, it is not so important to put large gains on them during the winter as if they were to be sold as grass-fat steers in the fall. When the production of feeders is the primary object, the greatest possible use of coarse roughages, produced on the farm, should be made. Growth and development of the yearling rather than production of fat or finish should be stimulated as much as possible.

The investigational work in West Virginia with yearlings is summarized in Table 3.

TABLE 3.—*Summary of four years' experiments with yearling steers*

Lot and winter ration [1]	Year	Winter feeding			Summer pasture		Winter and summer	
		Days fed	Gain (+) or loss (−) per head	Feed cost per head	Days	Gain (+) or loss (−) per head	Total gain (+) or loss (−) per head	Total feed cost per head [2]
LOT 1			*Pounds*			*Pounds*	*Pounds*	
Corn silage, mixed hay, and wheat straw.	First	128	−23	$13.71	168	+336	+313	$22.11
	Second	122	0	13.74	167	+344	+344	22.09
	Third	134	+19	16.03	157	+270	+289	23.88
Average		128	−1	14.49	164	+317	+316	22.69
LOT 2								
Corn silage, wheat straw, and cottonseed meal.	First	128	+74	14.47	168	+255	+329	22.87
	Second	122	+80	14.34	167	+278	+358	22.69
	Third	134	+52	14.60	157	+258	+310	22.45
	Fourth	133	+40	13.88	140	+258	+298	20.88
Average		129	+62	14.32	158	+262	+324	22.22
LOT 3								
Mixed hay and wheat straw.	First	128	−46	13.62	168	+315	+269	22.02
	Second	122	−7	15.03	167	+310	+303	23.38
	Third	134	−30	16.74	157	+306	+276	24.59
	Fourth	133	−56	17.30	140	+305	+249	24.30
Average		129	−35	15.67	158	+309	+274	23.57
LOT 4								
Corn silage and soy-bean hay.	Fourth	133	+27	14.76	140	+240	+267	21.76
LOT 5								
Corn silage, rye hay, and cottonseed meal.	Fourth	133	+11	16.82	140	+281	+292	23.82

[1] Quantities recommended for each feed are given on page 11.

[2] The total cost consists of the winter feed cost plus the cost of summer pasture figured at 5 cents per head per day for the number of days on pasture. Other feed prices are the same as shown in preceding tables.

A study of Table 3 shows that the steers in lots 1 and 3 which lost the most weight in winter made the greatest summer gains on pasture, but not necessarily the greatest yearly gains. Lot 2, gaining an average of 62 pounds per steer for the winter periods, made a yearly gain of 324 pounds, which was the greatest for all lots. The ration of corn silage, wheat straw, and cottonseed meal, fed to the steers of lot 2, produced the most gain on an average of four years, and at the lowest cost. A ration of mixed hay and wheat straw fed to lot 3 produced the smallest winter gains and was the most expensive ration, all the silage rations being cheaper. The results of these tests with yearlings indicate (1) that it is desirable to have steers gain from 50 to 75 pounds during the winter; (2) that a succulent ration containing silage is preferable to a mixed hay and straw ration; and (3) that cottonseed meal fed in conjunction with silage has an advantage over mixed hay and soy-bean hay, under conditions that existed during the progress of this experimental feeding. It is shown, also, that the addition of a small amount of cottonseed meal to a silage and rye-hay ration was not so satisfactory as a ration of silage and soy-bean hay.

WINTERING 2-YEAR-OLD STEERS

A large percentage of the grass-fat cattle from the Appalachian region go to the eastern markets in the fall as 3-year-olds, weighing

FIG. 5.—Two-year-old feeder steers in November, at the end of grazing season

from 1,250 to 1,400 pounds. Usually older cattle require more finish than younger cattle to bring equal prices. Three-year-old or older steers from this area generally are rather rough unless they possess considerable finish. It is therefore important for them to

FIG. 6.—Grass-fat 3-year-old steers in September. Typical pasture scene in the Appalachian region

put on a reasonable gain during their last winter. Table 4 gives a summary of three years' experimental work in West Virginia with 2-year-old steers.

TABLE 4.—*Summary of three years' experiments with 2-year-old steers*

Lot and winter ration [1]	Year	Winter feeding			Summer pasture		Winter and summer	
		Days fed	Gain (+) or loss (−) per head	Feed cost per head	Days	Gain (+) or loss (−) per head	Total gain (+) or loss (−) per head	Total feed cost per head [2]
LOT 1			*Pounds*			*Pounds*	*Pounds*	
Mixed hay and ear corn.	First	127	+35	$25.40	136	+307	+342	$39.00
	Second	121	+55	24.05	128	+285	+340	36.85
	Third	124	−37	19.19	141	+344	+307	33.29
Average		124	+18	22.88	135	+312	+330	36.38
LOT 2								
Corn silage	First	127	+37	11.43	136	+286	+323	25.03
	Second	121	−54	10.47	128	+363	+309	23.27
	Third	124	−6	10.46	141	+384	+378	24.56
Average		124	−9	10.78	135	+346	+337	24.28
LOT 3								
Corn silage	First	127	+79	15.24	136	+239	+318	28.84
	Second	121	+46	14.52	128	+305	+351	27.32
	Third	124	+72	13.43	141	+306	+378	27.53
Average		124	+66	14.40	135	+283	+349	27.90
LOT 4								
Corn silage and cottonseed meal.	First	127	+67	16.19	136	+297	+364	29.79
	Second	121	+15	15.01	128	+316	+331	27.81
	Third	124	+69	15.65	141	+322	+391	29.75
Average		124	+50	15.62	135	+312	+362	29.12
LOT 5								
Corn silage, wheat straw, and cottonseed meal.	First	127	+93	15.11	136	+250	+343	28.71
	Second	121	+62	14.53	128	+245	+307	27.33
	Third	124	+97	14.86	141	+280	+377	28.96
Average		124	+84	14.85	135	+258	+342	28.35
LOT 6								
Corn silage and mixed hay.	First	127	+63	18.51	136	+273	+336	32.11
	Second	121	+68	17.78	128	+243	+311	30.58
	Third	124	+46	15.95	141	+316	+362	30.05
Average		124	+59	17.41	135	+277	+336	30.91

[1] Quantities recommended for each feed are given on page 11.
[2] Feed prices same as in preceding tables, but pasture at 10 cents per head per day.

The steers in lot 2, fed 28.9 pounds of silage per head per day with no other feed, showed an average loss of 9 pounds each for the winter feeding during a period of three years. This lot made the highest summer gains, but the total summer and winter gain of 337 pounds did not equal that of lots 3, 4, and 5, which was 349, 362, and 342, respectively. The cost of the rations should be considered, however, in this connection. A comparison of lots 2 and 3 shows that while lot 3 made 12 pounds more gain per steer for the year, yet they made 63 pounds less gain during the summer. This increase in weight was at the expense of higher-priced feed as shown by the greater winter feed cost of $3.62 per steer.

As in the cases of the other cattle discussed, silage rations are shown to be the most economical wintering rations. The addition

of one-half pound of cottonseed meal per head per day to the ration for lot 2 increased the winter gains 59 pounds per steer, and the cost of the winter feed $4.84, as shown in lot 4. The price of cattle should determine the advisability of adding the meal. Generally, the addition of a protein meal to a silage ration is advisable, especially in the absence of a legume hay. The addition of approximately 6 pounds of wheat straw in place of one-half pound of cottonseed meal and 5 pounds of silage reduced the winter feed bill $0.77 per head, and produced practically the same gain. Here again the price of the feeds used should govern their use to a large extent. A mixed hay and grain ration is usually an expensive winter ration. This is shown rather conclusively in the results pertaining to lot 1.

SUGGESTED RATIONS

In the selection of feeds for winter rations for beef cattle, it is of prime importance to make the maximum use of roughages produced on the farm. Two-year-olds consume greater quantities in proportion to their weight than cattle of younger age. Young cattle should receive more protein in proportion to their weight than older cattle. Protein may be supplied either in a protein meal, such as cottonseed or linseed meal, or soy-bean meal, or in a legume hay, such as clover, alfalfa, or soy-bean hay. The essential point is to supply it in the cheapest form. This is easily determined by calculation if the price per ton of the feed and the per cent of protein in the feed are known. Cottonseed meal analyzing 43 per cent protein at $50 a ton would supply a pound of protein at 5.81 cents. Clover hay with a protein content of 14 per cent at $17 a ton would furnish a pound of protein at 6.07 cents.

Almost any one of the rations mentioned in the preceding tables are satisfactory so far as maintenance and gains in weight are concerned, but some are much more economical than others. The cost figures should be modified according to prevailing local prices of feeds. The most economical ration one year may be a very expensive one the next.

The following rations are suggested for wintering various classes of beef cattle:

RATIONS FOR BREEDING COWS

	Pounds per head per day
Corn silage	24
Cottonseed or linseed meal	1.5
Wheat or oat straw	8
Corn silage	24
Soy-bean hay	7.5
Wheat straw	3
Corn silage	30
Clover hay	6
Clover or alfalfa hay	15
Cottonseed cake	1
Wheat straw	6

RATIONS FOR CALVES

	Pounds per head per day
Corn silage	12
Clover hay	5
Corn silage	12
Cottonseed or linseed meal	0.5
Clover hay	3
Alfalfa or clover hay	8
Grain mixture	3
Soy-bean hay	7
Cottonseed cake	0.5
Wheat straw	2

RATIONS FOR YEARLING STEERS	Pounds per head per day
Corn silage	20
Mixed hay	5
Wheat or oat straw	3
Corn silage	24
Cottonseed or linseed meal	1
Straw	5
Corn silage	25
Clover or alfalfa hay	5
Legume hay	10
Cottonseed cake	1
Wheat straw	5

RATIONS FOR TWO-YEAR-OLD STEERS	Pounds per head per day
Corn silage	25
Cottonseed meal	1
Wheat straw	6
Corn silage	30
Cottonseed meal	1
Corn stover or straw	3
Corn silage	25
Mixed hay	8
Clover or alfalfa hay	12
Cottonseed cake	1.5
Wheat straw	6

SUMMARY

The winter feed bill is the greatest problem facing cattlemen in every beef-producing area. The winter feed costs generally constitute two-thirds of the yearly cost. It is therefore important to feed a combination of feeds that will produce satisfactory results at the lowest cost.

Grass should be depended on to produce the bulk of gain in weight.

Beef cattle that make large winter gains do not gain so much on grass the following summer as those that have made only slight gains or maintained their weight during the winter. It is desirable to have calves and yearlings put on from 50 to 75 pounds during the winter, but it is not necessary for older cattle to make any appreciable gain.

Silage rations are usually more economical than grain and hay rations for wintering beef cattle in the Appalachian region.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

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